# VERY LOW BIRTHWEIGHT AMONG MEDICAID NEWBORNS IN FIVE STATES: THE EFFECTS OF PRENATAL WIC PARTICIPATION

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UNITED STATES DEPARTMENT OF AGRICULTURE
FOOD AND NUTRITION SERVICE
OFFICE OF ANALYSIS AND EVALUATION

Enclosed is a copy of a new FNS report "Very Low Birthweight Among Medicaid Newborns in Five States: The Effects of Prenatal WIC Participation." This report contains new findings on birth outcomes among Medicaid beneficiaries, based on linked 1987-88 WIC, Medicaid, and Vital Records data. These are the same data that were used in FNS' original WIC Medicaid analysis, published in October 1990. This report extends the original analysis by examining whether participation in WIC decreases the incidence of very low birthweight (VLBW). A brief summary of the results follows:

- WIC participation was consistently associated with reductions in the prevalence of VLBW in all States except Minnesota.

- Estimated reductions in VLBW attributable to WIC ranged from 27 percent in Florida to 55 percent in South Carolina, with intermediate values of 39 percent in Texas, and 45 percent in North Carolina.

- Average savings in Medicaid costs associated with WIC ranged from $12,083 to $15,385 for each very low weight birth prevented.

- Aggregate savings ranged from $2.3 million in Florida to $4.5 million in North Carolina in the first 60 days after birth.

The income levels of pregnant women varied across States, reflecting differences in Medicaid eligibility criteria. This may explain the variation in outcomes. For example, Minnesota had the highest income eligibility standard of the study States in 1987-88, which may have resulted in smaller program impact in that State. Since 1987-88, both WIC and Medicaid have expanded coverage of pregnant women. Increased access to program services may affect the long-term stability of the results. The net effect of the changes on the estimates is uncertain.

Reducing the incidence of very low birthweight is an important way to improve health and reduce costs. The results presented here provide further support for the strong positive benefit-cost ratios in the previously published WIC Medicaid reports.

To obtain additional copies of the report, please contact the Office of Analysis and Evaluation at (703) 305-2133.

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## EXECUTIVE SUMMARY

This study is an analysis of very low birthweight among Medicaid newborns and the effect of prenatal WIC participation on the likelihood of very low birthweight. The analysis is an extension of the work conducted under the WIC/Medicaid Study, and is based on newborn analysis files for five states--Florida, Minnesota, North Carolina, South Carolina, and Texas. The study period included all Medicaid births in 1987 for Florida, Minnesota, North Carolina, South Carolina, and all Medicaid births from January through June 1988 in Texas.

Very low birthweight is defined as birthweight of less than 1,500 grams, or 3.3 pounds. Very low birthweight in the five study states was a rare event, ranging from 1.9 percent of Medicaid newborns in Minnesota to 2.9 percent in North Carolina during the study period. However, very low-birthweight newborns were very expensive and had infant mortality rates that far exceeded those of newborns that were not low birthweight. Average maternal and newborn Medicaid costs from birth to 60 days after birth for very low-birthweight newborns were roughly 3 to 4 times the average for newborns that were moderately low birthweight (1,500 to 2,499 grams) and 9 to 12 times the average for newborns that were not low birthweight (2,500 grams and over). Infant mortality rates for very low-birthweight Medicaid newborns ranged from 210.8 infant deaths per 1,000 live births in Florida to 306.1 in South Carolina, compared to a range of 16.7 to 44.4 for moderately low-birthweight newborns and 4.5 to 7.5 for normal-birthweight newborns.

In Florida, Minnesota, North Carolina, and South Carolina, prenatal WIC participation is associated with a significant decrease in the probability of very low birthweight. The predicted percentages of very low-birthweight Medicaid newborns for prenatal WIC participants are roughly half the predicted percentages for nonparticipants. For women enrolling in the WIC program by 30 weeks gestation, the estimated reduction in the percent of live births that were very low birthweight is .6 percentage points in Florida, 1.7 percentage points in North Carolina, 2.1 percentage points in South Carolina, and .9 percentage points in Texas.

The estimated number of very low-birthweight births prevented by prenatal WIC participation by 30 weeks ranges from 191 births in Florida to 352 births in North Carolina, with intermediate values of 231 births in Texas and 247 births in South Carolina. Estimated Medicaid cost savings from the reduction in the incidence of very low-birthweight newborns are substantial, and are equal to $2.3 million in Florida, $4.5 million in North Carolina, $3.8 million in South Carolina, and $3.4 million in Texas.

# VERY LOW BIRTHWEIGHT AMONG MEDICAID NEWBORNS IN FIVE STATES: THE EFFECTS OF PRENATAL WIC PARTICIPATION

This report summarizes the findings from an analysis of very low birthweight among Medicaid newborns and the effect of prenatal WIC participation on the likelihood of very low birthweight. The analysis extends the work conducted under the WIC/Medicaid Study, and is based on newborn analysis files for five states--Florida, Minnesota, North Carolina, South Carolina, and Texas.

The report is organized in four sections: the first section provides an overview of the WIC/Medicaid study; the second section describes the WIC/Medicaid database; the third section discusses a key analytic issue--the definition of prenatal WIC participation; and the final section presents descriptive and multivariate results. An appendix contains tables with detailed analysis results.

## OVERVIEW OF THE WIC/ MEDICAID STUDY

The WIC/Medicaid study examined the relationship between prenatal WIC participation, Medicaid costs from birth to 60 days after birth, and a variety of birth outcomes. The birth outcomes included newborn birthweight, gestational age, the likelihood of low birthweight, and the likelihood of a preterm birth for Medicaid beneficiaries.

Five states were included in the WIC/Medicaid study--Florida, Minnesota, North Carolina, South Carolina, and Texas. The study period included all Medicaid births in 1987 for Florida, Minnesota, North Carolina, and South Carolina, and all Medicaid births from January through June 1988 in Texas. As shown in Table 1, the five study states exhibited some striking contrasts in birth outcomes and perinatal risk factors. Minnesota had birth outcomes that were more favorable than those of the other study states. Both its infant mortality rate and percentage of low-birthweight infants (birthweight of less than 2,500 grams, or 5.5 pounds) were the lowest of the five states and were lower than the rate for the nation as a whole. In contrast, all of the three southeastern states--Florida, North Carolina, and South Carolina--had infant mortality rates that were higher than the national average. Texas is an extremely large state, accounting for roughly 8 percent of all U.S. births. In 1987, its infant mortality rate was below the U.S. average, although a relatively high proportion of women received late or no prenatal care.

TABLE 1

BIRTH OUTCOMES AND PERINATAL RISK FACTORS: U.S. AND STUDY STATES

| | U.S. | Florida | Minnesota | North Carolina | South Carolina | Texas |
|---|---|---|---|---|---|---|
| Total Births, 1987 | 3,809,394 | 175,144 | 65,173 | 93,501 | 52,801 | 301,962 |
| Infant Mortality Rate, 1987[a] | 10.1 | 10.6 | 8.7 | 11.9 | 12.7 | 9.1 |
| Percent Low Birthweight, 1987[b] | 6.9 | 7.7 | 5.0 | 7.9 | 8.6 | 6.9 |
| Percent of Women Ages 15-44 Below Poverty, 1984-86 | 15.2 | 15.4 | 11.4 | 14.0 | 17.3 | 15.2 |
| Percent of Births to Women Receiving Late or No Prenatal Care, 1986 | 6.0 | 8.6 | 3.8 | 4.6 | 8.1 | 11.5 |

SOURCE: National Center for Health Statistics (1988 and 1989), Newacheck (1988), and Hughes et al. (1989).

[a]Number of infant deaths per 1,000 live births.

[b]Birthweight of less than 2,500 grams.

The data on perinatal risk factors presented in Table 1 are, for the most part, consistent with the birth outcomes of the five study states. In particular, Minnesota had very favorable birth outcomes and had both the lowest percentage of women with incomes below poverty and the lowest percentage receiving late or no prenatal care. In contrast, South Carolina had the highest percentage of women of childbearing age below poverty, a higher than average percentage receiving late or no prenatal care, and the highest rates of infant mortality and low birthweight. Such differences across the study states are very important to consider in interpreting the WIC/Medicaid study results.

The principal findings from the WIC/Medicaid study indicate considerable Medicaid cost savings for prenatal WIC participants (Devaney et al., 1990 and 1991). The estimated savings in maternal and newborn Medicaid costs during the first 60 days after birth associated with prenatal participation in the WIC program ranged from $277 in Minnesota to $598 in North Carolina, with intermediate values of $347, $493, and $565 in Florida, Texas, and South Carolina, respectively. The associated ratios of Medicaid cost savings to WIC program costs ranged from 1.77 in Florida to 3.13 in North Carolina, indicating that for every dollar spent on the prenatal WIC program, the associated savings in Medicaid costs for newborns and mothers during the first 60 days after birth were between $1.77 (Florida) and $3.13 (North Carolina).

In all five study states, prenatal WIC participation by Medicaid beneficiaries was associated with increased birthweight and a lower incidence of low birthweight. The average increase in birthweight related to prenatal WIC participation by Medicaid beneficiaries ranged from 51 grams in Minnesota to 73 and 77 in Florida and Texas, respectively, to 113 and 117 grams in South Carolina and North Carolina, respectively. In addition, the estimated reduction in the percentage of Medicaid mothers who had low-birthweight newborns (birthweight less than 2,500 grams, or 5.5 pounds) attributable to prenatal WIC participation ranged from 2.2 percentage points in Minnesota to 5.1 percentage points in North Carolina and South Carolina.

One birth outcome not examined in the WIC/Medicaid study is the incidence of *very low birthweight* among Medicaid beneficiaries. Very low birthweight is newborn birthweight less than 1,500 grams (3.3 pounds). Low birthweight in general, and especially very low birthweight, is a primary determinant of infant mortality and morbidity (McCormick, 1985). Neonatal and infant mortality rates are considerably higher for low-

birthweight and very low-birthweight newborns relative to newborns that are not low birthweight. One study found that, relative to normal-birthweight newborns, low-birthweight newborns were 40 times more likely to die in the neonatal period and very low-birthweight newborns were 200 times more likely to die in the neonatal period (Shapiro et al., 1980).

Given the severe consequences of very low birthweight, an important policy question is the extent to which very low birthweight can be avoided. The objective of this study is to examine the determinants of very low birthweight among Medicaid newborns and to assess the effects of prenatal WIC participation on the incidence of very low birthweight. The major goal of the prenatal WIC program is to improve the nutritional status of participants through the provision of food supplements, nutrition education, and health and social service referrals to low-income pregnant women. Prenatal WIC participation may affect the probability of very low birthweight in two main ways. First, the provision of food supplements and nutrition education during pregnancy may lead to increased birthweight, and increases in birthweight should result in a lower percentage of very low-birthweight newborns. Second, the health and social service referrals provided by the WIC program staff are expected to result in increased use of prenatal care, which may have independent effects on the birthweight distribution of WIC participants.

## WIC/MEDICAID DATABASE

The database constructed for the WIC/Medicaid study served four major purposes: (1) to identify Medicaid mothers and newborns, (2) to provide information on Medicaid costs from birth to 60 days after birth, (3) to determine whether the mother participated in the WIC program while she was pregnant, and (4) to provide information on birth outcomes and on the use of prenatal care. In each state, the analysis database was constructed from the linkage of three main state data files--the Medicaid paid claims and eligibility files, the WIC program files, and the Vital Records files.

Medicaid eligibility and paid claims files served two purposes: (1) to identify Medicaid-covered births, and (2) to provide data on Medicaid costs for the analysis. The analysis sample includes **all** Medicaid-covered births that occurred in 1987 in Florida, Minnesota, North Carolina and South Carolina, and those in the first six months of 1988 in Texas. In Texas, the study is based on all Medicaid births that occurred during the period from January 1988 through June 1988, since the data necessary to

identify WIC prenatal participants were not available for births in an earlier period.

Data from the states' WIC data systems were used to determine whether a Medicaid-covered mother was receiving WIC benefits while she was pregnant and, if so, the costs of providing the WIC food packages. For the WIC/Medicaid study, prenatal WIC participation was defined as the following: for Florida, Minnesota, and North Carolina, if the woman redeemed at least one food instrument during the nine months prior to birth; for South Carolina, if she was issued a food instrument during the nine months prior to birth; and, in Texas, if she had a WIC certification date sometime during the nine months prior to birth. As discussed in detail below, the analysis of very low birthweight summarized in this memo considers alternative definitions of prenatal participation in assessing the effects of WIC participation on the incidence of very low birthweight.

Data from the Vital Records birth certificate files retained for the study included: sex, number, duration of gestation, and birthweight of newborns; age, race, ethnicity, education, and marital status of mothers; indicators of prenatal care; and number of previous live births and previous pregnancy terminations. The adequacy of prenatal care was measured with a modified Kessner Index. The Kessner Index combines information on the timing of entry into prenatal care with the number of visits recorded and the length of pregnancy. For a full-term pregnancy, adequate prenatal care is defined as nine or more visits, with the first visit occurring during the first trimester of pregnancy, and inadequate care is defined as four or fewer visits. Intermediate care for a full-term pregnancy encompasses all levels of prenatal care in between the two extremes. Adequate prenatal care for preterm births (births of less than 37 weeks gestation) requires a decreasing number of visits as the length of gestation decreases.

To conduct the analysis of the effects of prenatal WIC participation on Medicaid costs and birth outcomes, the data on Medicaid costs, WIC participation, and birth outcomes and prenatal care adequacy were combined for each Medicaid-covered birth. Overall, the WIC/Medicaid analysis database includes nearly 105,000 Medicaid births. The proportion of these births occurring to WIC participants varied across the study states, ranging from nearly one-half of the Medicaid births in Texas to almost three-quarters of the Medicaid births in South Carolina.

**PRENATAL WIC PARTICIPATION**

As discussed above, the primary WIC participation variable used in the WIC/Medicaid study is a simple binary variable that equals one if the woman participated in the WIC program any time during her pregnancy and equals zero otherwise. One potential problem with this specification is that it constrains the effect of prenatal WIC participation to be the same regardless of when during pregnancy women enrolled in the WIC program. WIC participants included some women who enrolled early in pregnancy and some who enrolled late in pregnancy. The pregnancy outcomes are likely to be more favorable and Medicaid costs less for the group of later WIC enrollees relative to early enrollees in the WIC program for reasons that are related mostly to longer pregnancy durations rather than to WIC participation. In addition, for the later enrollees, there is the potential for an overstatement of the effects of prenatal WIC participation since birth outcomes for late WIC enrollees with longer gestational ages are compared with the birth outcomes for nonparticipants, some of whom had low-gestational age births and did not have the opportunity to enroll later as prenatal WIC participants.

This issue of the timing of prenatal WIC enrollment is particularly important in the context of an analysis of very low birthweight. As shown in Table 2, although very low birthweight among Medicaid newborns is a rare event, ranging from 1.9 percent of Medicaid births in Minnesota to 2.9 percent in North Carolina in 1987, the percentage of Medicaid newborns that were very low birthweight is strongly related to gestational age. The vast majority of newborns born at less than 28 weeks gestation were very low birthweight. In fact, all but one Medicaid newborn in Minnesota with gestational age less than 28 weeks was very low birthweight. For newborns born from 28 to 30 weeks gestation, between 40 and 80 percent were very low birthweight. In contrast, the incidence of very low birthweight for Medicaid newborns with gestational age greater than 32 weeks was quite low, at roughly .5 percent of such births.

Given this strong relationship between very low birthweight and gestational age, it is inappropriate to include late prenatal WIC enrollees as WIC participants. That is, WIC participants who enroll after 32 weeks will be very unlikely to have very low birthweight newborns simply because their pregnancies are longer, and it would be incorrect to attribute the effect of the duration of pregnancy on very low birthweight to WIC participation.

TABLE 2

INCIDENCE OF VERY LOW BIRTHWEIGHT AMONG MEDICAID NEWBORNS BY GESTATIONAL AGE

| | Florida | Minnesota | North Carolina | South Carolina | Texas |
|---|---|---|---|---|---|
| **Total** | | | | | |
| Number of Very Low Birthweight Newborns | 778 | 218 | 597 | 294 | 510 |
| Percent of Live Births | 2.2 % | 1.9 % | 2.9 % | 2.5 % | 2.0 % |
| **Gestational Age** | | | | | |
| Unknown | | | | | |
| Number of Very Low Birthweight Newborns | 60 | 41 | 48 | 4 | 68 |
| Percent of Live Births | 6.0 % | 6.5 % | 7.5 % | 4.9 % | 4.6 % |
| < 28 Weeks | | | | | |
| Number of Very Low Birthweight Newborns | 238 | 69 | 210 | 103 | 175 |
| Percent of Live Births | 67.4 % | 98.6 % | 75.3 % | 81.1 % | 73.5 % |
| 28-30 Weeks | | | | | |
| Number of Very Low Birthweight Newborns | 221 | 57 | 141 | 75 | 113 |
| Percent of Live Births | 48.6 % | 79.2 % | 48.0 % | 39.9 % | 37.4 % |
| 31-32 Weeks | | | | | |
| Number of Very Low Birthweight Newborns | 108 | 13 | 68 | 40 | 73 |
| Percent of Live Births | 18.5 % | 17.1 % | 19.4 % | 16.9 % | 18.4 % |
| > 32 Weeks | | | | | |
| Number of Very Low Birthweight Newborns | 151 | 38 | 130 | 72 | 81 |
| Percent of Live Births | .5 % | .4 % | .7 % | .7 % | .4 % |

SOURCE: WIC/Medicaid newborn database.

NOTE: Very low birthweight is birthweight less than 1,500 grams, or 3.3 pounds.

To account for the relationship between gestational age and the incidence of very low birthweight, we consider two alternative definitions of prenatal WIC participation: (1) WIC participation by 32 weeks gestation, and (2) WIC participation by 30 weeks gestation. Specifically, participants who enrolled in the WIC program after 32 weeks gestation in the first case and 30 weeks in the second case were considered nonparticipants.

## EMPIRICAL RESULTS

This section describes the results from descriptive and multivariate analyses of very low birthweight among Medicaid newborns. The descriptive analysis examines the incidence of very low birthweight and selected characteristics of very low-birthweight newborns, low-birthweight newborns, and normal-birthweight newborns. The multivariate analysis examines the relationship between very low birthweight and prenatal WIC participation when other factors are controlled for.

### Descriptive Analysis of Very Low Birthweight

As discussed above, very low birthweight in the five WIC/Medicaid study states was a rare event, ranging from 1.9 percent of Medicaid newborns in Minnesota to 2.9 percent in North Carolina during the study period. However, very low birthweight newborns were very expensive and had infant mortality rates that far exceeded those of newborns that were not very low birthweight, as shown in Table 3. Average maternal and newborn Medicaid costs from birth to 60 days after birth for very low birthweight newborns were roughly 3 to 4 times the average for newborns that were moderately low birthweight (1500 to 2499 grams) and 9 to 12 times the average for newborns that were not low birthweight (2500 grams and over). Infant mortality rates for very low birthweight newborns ranged from 210.8 infant deaths per 1,000 live births in Florida to 306.1 in South Carolina, compared to a range of 16.7 to 44.4 for moderately low-birthweight newborns and 4.5 to 7.5 for normal-birthweight newborns.

Descriptive data on the incidence of very low birthweight are presented in Table 4. The percentage of Medicaid newborns who were very low-birthweight was lower for prenatal WIC participants than for nonparticipants, regardless of the measure of prenatal WIC participation. In all five states, Medicaid mothers who did not participate in the WIC program during pregnancy were approximately two to three times as likely to have had very low-birthweight newborns as WIC participants. The incidence of very low-birthweight also varied by race, with blacks having higher than average rates of very low birthweight and Hispanics having

TABLE 3

AVERAGE MEDICAID COSTS AND INFANT MORTALITY
BY BIRTHWEIGHT: MEDICAID NEWBORNS

| | Very Low Birthweight: <1,500 Grams | Moderately Low Birthweight: 1,500-2,499 Grams | Normal Birthweight: ≥2,500 Grams |
|---|---|---|---|
| **Florida** | | | |
| Average Medicaid Costs | $17,677 | $5,417 | $1,911 |
| Infant Mortality Rate | 210.8 | 16.7 | 4.7 |
| **Minnesota** | | | |
| Average Medicaid Costs | $35,106 | $10,231 | $2,849 |
| Infant Mortality Rate | 294.1 | 44.4 | 6.1 |
| **North Carolina** | | | |
| Average Medicaid Costs | $17,315 | $4,645 | $2,012 |
| Infant Mortality Rate | 261.3 | 25.9 | 7.5 |
| **South Carolina** | | | |
| Average Medicaid Costs[a] | $20,207 | $4,676 | $1,702 |
| Infant Mortality Rate | 306.1 | 28.7 | 7.0 |
| **Texas** | | | |
| Average Medicaid Costs | $22,224 | $7,427 | $2,466 |
| Infant Mortality Rate[b] | 186.3 | 22.8 | 4.5 |

SOURCE: WIC/Medicaid newborn database.

NOTE: Medicaid costs are maternal and newborn costs from birth to 60 days after birth. Medicaid costs were prorated for claims that extended beyond the first 60 days after birth. Infant mortality rate is the number of deaths to infants less than 1 year of age (except in Texas) per 1,000 live births.

[a]Hospital costs only.

[b]In Texas, the infant mortality rate refers to deaths to infants less than 6 months of age.

TABLE 4

INCIDENCE OF VERY LOW BIRTHWEIGHT AMONG MEDICAID NEWBORNS

| | Florida | Minnesota | North Carolina | South Carolina | Texas |
|---|---|---|---|---|---|
| **Total** | | | | | |
| Number of Very Low Birthweight Newborns | 778 | 218 | 597 | 294 | 510 |
| Percent of Live Births | 2.2 % | 1.9 % | 2.9 % | 2.5 % | 2.0 % |
| **WIC Participation** | | | | | |
| Prenatal Participants | | | | | |
| Number of Very Low Birthweight Newborns | 278 | 110 | 250 | 131 | 127 |
| Percent of Live Births | 1.4 % | 1.4 % | 1.8 % | 1.5 % | 1.0 % |
| Nonparticipants | | | | | |
| Number of Very Low Birthweight Newborns | 500 | 108 | 347 | 163 | 383 |
| Percent of Live Births | 3.3 % | 2.9 % | 5.4 % | 5.2 % | 2.9 % |
| Participants by 32 Weeks | | | | | |
| Number of Very Low Birthweight Newborns | 269 | 91 | 227 | 126 | 124 |
| Percent of Live Births | 1.5 % | 1.4 % | 1.8 % | 1.6 % | 1.2 % |
| Nonparticipants by 32 Weeks | | | | | |
| Number of Very Low Birthweight Newborns | 509 | 127 | 370 | 168 | 386 |
| Percent of Live Births | 2.8 % | 2.5 % | 4.4 % | 4.3 % | 2.5 % |
| Participants by 30 Weeks | | | | | |
| Number of Very Low Birthweight Newborns | 259 | 89 | 227 | 123 | 119 |
| Percent of Live Births | 1.6 % | 1.4 % | 1.8 % | 1.6 % | 1.3 % |
| Nonparticipants by 30 Weeks | | | | | |
| Number of Very Low Birthweight Newborns | 519 | 129 | 370 | 171 | 391 |
| Percent of Live Births | 2.7 % | 2.4 % | 4.4 % | 4.1 % | 2.4 % |
| **Race/Ethnicity of Mother**[a] | | | | | |
| White | | | | | |
| Number of Very Low Birthweight Newborns | 242 | 144 | 168 | 57 | 118 |
| Percent of Live Births | 1.6 % | 1.6 % | 2.2 % | 1.9 % | 2.0 % |
| Black | | | | | |
| Number of Very Low Birthweight Newborns | 481 | 29 | 429 | 237 | 165 |
| Percent of Live Births | 2.9 % | 2.6 % | 3.3 % | 2.7 % | 2.3 % |
| Hispanic | | | | | |
| Number of Very Low Birthweight Newborns | 49 | -- | -- | -- | 159 |
| Percent of Live Births | 1.5 % | -- | -- | -- | 1.4 % |
| **Marital Status** | | | | | |
| Married | | | | | |
| Number of Very Low Birthweight Newborns | 230 | 137 | 162 | 71 | 228 |
| Percent of Live Births | 1.8 % | 2.0 % | 2.5 % | 2.0 % | 1.9 % |
| Not Married | | | | | |
| Number of Very Low Birthweight Newborns | 547 | 81 | 435 | 223 | 280 |
| Percent of Live Births | 2.4 % | 1.6 % | 3.1 % | 2.7 % | 2.1 % |

TABLE 4 (continued)

| | Florida | Minnesota | North Carolina | South Carolina | Texas |
|---|---|---|---|---|---|
| **Age of Mother** | | | | | |
| < 18 Years of Age | | | | | |
| Number of Very Low Birthweight Newborns | 94 | 20 | 91 | 50 | 66 |
| Percent of Live Births | 2.2 % | 2.2 % | 3.2 % | 3.3 % | 2.3 % |
| 18-19 Years of Age | | | | | |
| Number of Very Low Birthweight Newborns | 120 | 52 | 108 | 61 | 87 |
| Percent of Live Births | 2.0 % | 2.6 % | 2.8 % | 2.6 % | 1.8 % |
| 20-34 Years of Age | | | | | |
| Number of Very Low Birthweight Newborns | 537 | 141 | 381 | 173 | 329 |
| Percent of Live Births | 2.2 % | 1.7 % | 2.8 % | 2.3 % | 1.9 % |
| 35 Years and Older | | | | | |
| Number of Very Low Birthweight Newborns | 27 | 5 | 17 | 10 | 28 |
| Percent of Live Births | 2.3 % | 1.0 % | 3.5 % | 3.6 % | 3.0 % |
| **Kessner Index** | | | | | |
| Unknown | | | | | |
| Number of Very Low Birthweight Newborns | 56 | 78 | 27 | 8 | 64 |
| Percent of Live Births | 4.8 % | 4.5 % | 5.5 % | 3.7 % | 3.1 % |
| Inadequate | | | | | |
| Number of Very Low Birthweight Newborns | 222 | 31 | 124 | 96 | 162 |
| Percent of Live Births | 4.2 % | 2.7 % | 6.6 % | 4.7 % | 3.2 % |
| Intermediate | | | | | |
| Number of Very Low Birthweight Newborns | 250 | 45 | 264 | 109 | 141 |
| Percent of Live Births | 1.5 % | 1.1 % | 3.2 % | 1.9 % | 1.3 % |
| Adequate | | | | | |
| Number of Very Low Birthweight Newborns | 250 | 64 | 182 | 81 | 143 |
| Percent of Live Births | 1.9 % | 1.3 % | 1.8 % | 2.2 % | 1.8 % |
| **Plurality** | | | | | |
| Singleton | | | | | |
| Number of Very Low Birthweight Newborns | 647 | 189 | 494 | 250 | 415 |
| Percent of Live Births | 1.9 % | 1.7 % | 2.5 % | 2.2 % | 1.7 % |
| Multiple Birth | | | | | |
| Number of Very Low Birthweight Newborns | 131 | 29 | 103 | 44 | 95 |
| Percent of Live Births | 14.7 % | 9.6 % | 18.3 % | 15.3 % | 14.4 % |

SOURCE: WIC/Medicaid newborn database.

NOTE: Very low birthweight is birthweight less than 1,500 grams, or 3.3 pounds.

[a]Racial/ethnicity groups varied across states. In North Carolina and South Carolina, a small number of women classified neither as white nor black are included with black women. In Texas, "black" means "black, nonspanish."

generally lower than average rates. With the exception of Minnesota, married mothers had lower rates of very low birthweight than unmarried mothers, although in Texas the difference was quite small. Differences observed by age were also small, although the rates of very low birthweight were generally lowest for women aged 20-34 years. As expected, plurality is strongly related to the incidence of very low birthweight, with multiple births considerably more likely to be very low birthweight than singleton births. Between 9.6 and 18.3 percent of multiple births among Medicaid beneficiaries were very low birthweight, as compared with between 1.7 and 2.5 percent of singleton births.

Substantial differences in the incidence of very low birthweight are observed for women who differ in the adequacy of prenatal care. In particular, women who received inadequate levels of prenatal care had higher rates of very low birthweight than women who received either intermediate or adequate levels of prenatal care. Interestingly, women with missing data on the adequacy of prenatal care (because of missing data on either gestational age, number of prenatal care visits, or the timing of the first prenatal care visit) also had higher than average rates of very low birthweight.

**Multivariate Analysis of Very Low Birthweight**

The multivariate analysis examines the relationship between the likelihood of very low birthweight and prenatal WIC participation. The dependent variable for the analysis is dichotomous, equal to one if newborn birthweight is less than the cutoff for very low birthweight (1500 grams) and equal to zero otherwise. Probit, a maximum likelihood estimation procedure for dichotomous dependent variables, is used to estimate the state-specific very low-birthweight models.

As discussed previously, different specifications of prenatal WIC participation were used in the analysis: (1) participation at any time during pregnancy, (2) participation by 32 weeks gestation, and (3) participation by 30 weeks gestation. Because the vast majority of very low-birthweight newborns are also low-gestational age newborns, the first specification, which includes late WIC enrollees as participants, is expected to confound WIC effects with gestational age effects and to lead to an overstatement of the relationship between prenatal WIC participation and the likelihood of very low birthweight. The results from this specification are presented primarily to provide a comparison with more conservative definitions of prenatal WIC participation.

Estimated probit coefficients do not have an intuitive interpretation except to show the direction of the effects of the independent variables on the likelihood or probability of very low birthweight. However, the estimated coefficients can be used to calculate the predicted probability of very low birthweight with and without prenatal WIC participation. These predicted probabilities are constructed by computing for each observation the predicted probability that the newborn is very low birthweight when the WIC participation variable is set equal to 0 (nonparticipant) and when it is set equal to 1 (participant). These probabilities are then averaged and multiplied by 100 to obtain the predicted percentage of very low-birthweight newborns with and without the WIC program. These predicted percentages of very low-birthweight newborns, as well as the estimated probit coefficients of prenatal WIC participation, are presented in Table 5. Detailed probit results are presented in the appendix to this memo.

With the exception of Minnesota, prenatal WIC participation is associated with a significant decrease in the probability of very low birthweight. (See Table 5.) The predicted percentages of very low-birthweight newborns for prenatal WIC participants are roughly half the predicted percentages for nonparticipants. Using the variable for WIC participation by 32 weeks, the estimated reduction in the percentage of women who gave birth to very low-birthweight Medicaid newborns ranges is .7 percentage points in Florida, 1.1 percentage points in Texas, 2.0 percentage points in North Carolina, and 2.3 percentage points in South Carolina. When the cutoff for WIC enrollment is lowered to 30 weeks gestation, the estimated effects of prenatal WIC participation are reduced slightly, ranging from .6 to 2.1 percentage points, but are still statistically significant. As expected, the specification that includes all prenatal WIC enrollees as participants leads to the largest estimated differences in the percentage of very low birthweight between WIC participants and nonparticipants. However, as discussed above, these differences are at least partially attributed to gestational age differences between WIC participants and nonparticipants.

While these results suggest that prenatal WIC participation is associated with reductions in the percentage of very low-birthweight Medicaid newborns, significant differences are found in the magnitude of the WIC effects across the study states. The estimated effects of prenatal WIC participation by Medicaid beneficiaries on the incidence of very low birthweight were greatest in North Carolina and South Carolina, while no statistically significant effect was found for Minnesota. Interstate comparisons of study findings must be made cautiously, however, since the

TABLE 5

RESULTS OF AN ANALYSIS OF VERY LOW BIRTHWEIGHT

| | Probit Coefficient | Percentage of Very Low Birthweight Newborns | | |
|---|---|---|---|---|
| | | Without WIC | With WIC | Difference |
| **Florida** | | | | |
| Prenatal WIC Participation | -.299 ** (.036) | 2.7 % | 1.4% | 1.3% |
| WIC Participation by 32 Weeks | -.171 ** (.037) | 2.3 | 1.6 | .7 |
| WIC Participation by 30 Weeks | -.130 ** (.037) | 2.2 | 1.6 | .6 |
| **Minnesota** | | | | |
| Prenatal WIC Participation | -.221 ** (.067) | 1.9% | 1.1% | .8% |
| WIC Participation by 32 Weeks | -.032 (.068) | 1.5 | 1.4 | .1 |
| WIC Participation by 30 Weeks | .0005 (.068) | 1.4 | 1.4 | 0.0 |
| **North Carolina** | | | | |
| Prenatal WIC Participation | -.462 ** (.039) | 4.9% | 1.9% | 3.0% |
| WIC Participation by 32 Weeks | -.326 ** (.040) | 4.0 | 2.0 | 2.0 |
| WIC Participation by 30 Weeks | -.287 ** (.040) | 3.8 | 2.1 | 1.7 |
| **South Carolina** | | | | |
| Prenatal WIC Participation | -.515 ** (.054) | 4.9% | 1.6% | 3.3% |
| WIC Participation by 32 Weeks | -.397 ** (.054) | 4.0 | 1.7 | 2.3 |
| WIC Participation by 30 Weeks | -.363 ** (.054) | 3.8 | 1.7 | 2.1 |
| **Texas** | | | | |
| Prenatal WIC Participation | -.386 ** (.043) | 2.7% | 1.1% | 1.6% |
| WIC Participation by 32 Weeks | -.251 ** (.044) | 2.4 | 1.3 | 1.1 |
| WIC Participation by 30 Weeks | -.228** (.044) | 2.3 | 1.4 | .9 |

SOURCE: WIC/Medicaid newborn database.

*(**): Significant at .05(.01) level.

characteristics of the WIC and Medicaid populations differed considerably across the study states, and such differences are important factors in the assessment of the effects of WIC participation.

Specifically, in 1987, the characteristics of the Medicaid-eligible populations differed considerably across the five study states. Medicaid beneficiaries in Minnesota were predominantly white and married, were somewhat older, and had more years of education than those in the other four states (Devaney et al., 1990). In addition, because of differences in the income-eligibility standards across the states, the Medicaid populations in the study states were not comparable socioeconomically. In 1987, the poverty income threshold for a family of three was $9,056; across the five study states, the Medicaid income eligibility thresholds ranged from 33 percent of the poverty level in Texas ($2,988 for a family of three) to 88 percent in Minnesota ($7,969 for a family of three). The other three states had income eligibility thresholds between 40 and 50 percent of the poverty level. The differences in Medicaid income eligibility across the states during the study period are likely to have a significant effect on the study findings and must be considered when the implications of the analysis findings are assessed. A priori, one would expect that the benefits of WIC program participation would be greatest among the most severely disadvantaged women. This expectation is consistent with the apparently smaller program impact in Minnesota.

The incidence of very low birthweight is also significantly related to the adequacy of prenatal care, as shown in Appendix Tables A.1-A.3. In all five states, receiving inadequate versus either adequate or intermediate levels of prenatal care is associated with a higher likelihood of very low-birthweight. These findings are consistent with the earlier WIC/Medicaid study findings that the adequacy of prenatal care is significantly related to improved birth outcomes, above and beyond the effects of prenatal WIC participation (Devaney et al., 1990). However, the estimated effects of receiving intermediate versus adequate levels of prenatal care vary in both sign and magnitude across the states. In Minnesota, the incidence of very low birthweight is significantly higher for women receiving intermediate versus adequate levels of prenatal care, while the opposite is true in Texas. With the exception of South Carolina, the incidence of very low-birthweight is significantly higher for women with missing values for the adequacy of prenatal care index relative to women with adequate levels of prenatal care.

## SUMMARY

In summary, prenatal WIC participation in Florida, North Carolina, South Carolina, and Texas is associated with reductions in the incidence of very low-birthweight newborns. For women enrolling in the WIC program by 30 weeks gestation, the estimated reduction in the percent of live births that were very low birthweight is .6 percentage points in Florida, 1.7 percentage points in North Carolina, 2.1 percentage points in South Carolina, and .9 percentage points in Texas. (For women enrolling by 32 weeks gestation, the estimated reductions in the percent of live births that were very low birthweight ranges from .7 percentage points to 2.3 percent percentage points.) While these numbers may seem small, it is important to remember that very low birthweight is itself a rare event, and, consequently, these participant-nonparticipant differences represent large differences in the incidence of very low birthweight. As shown in Table 6, with the exception of Minnesota, the estimated number of very low-birthweight births prevented by prenatal WIC participation by 30 weeks ranges from 191 births in Florida to 352 births in North Carolina, with intermediate values of 231 births in Texas and 247 births in South Carolina.

As a rough approximation to the savings in Medicaid costs from participation in the WIC program during pregnancy, the reduction in the number of very low-birthweight births associated with prenatal WIC participation can be multiplied by the difference in average Medicaid costs between very low-birthweight and low-birthweight newborns.[1] The last row of Table 6 presents these figures and indicates substantial savings in newborn and maternal Medicaid costs from birth to 60 days after birth associated with the reduction in the percentage of very low-birthweight newborns. Estimated Medicaid cost savings are $2.3 million in Florida, $4.5 million in North Carolina, $3.8 million in South Carolina, and $3.4 million in Texas.

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[1]These calculations assume that all very low-birthweight newborns prevented were moderately low-birthweight newborns. It is likely that at least some of these births were normal-birthweight newborns, in which case the savings in Medicaid costs would be larger than those presented in Table 6.

TABLE 6

ESTIMATED SAVINGS IN MEDICAID COSTS FROM THE PREVENTION OF VERY LOW-BIRTHWEIGHT MEDICAID NEWBORNS

| | Florida | Minnesota | North Carolina | South Carolina | Texas |
|---|---|---|---|---|---|
| Actual Number of Very Low-Birthweight Medicaid Newborns | 778 | 218 | 597 | 294 | 510 |
| Estimated Number of Very Low-Birthweight Medicaid Births Prevented[a] | 191 | 0 | 352 | 247 | 231 |
| Estimated Savings in Medicaid Costs (Millions)[b] | $2.3 | 0 | $4.5 | $3.8 [c] | $3.4 |

SOURCE: WIC/Medicaid newborn database.

[a]Calculated by multiplying the estimated reduction in the percentage of very low-birthweight newborns due to prenatal WIC participation by 30 weeks (Table 4) by the total number of Medicaid births during the study period for each state (Appendix Table A.3).

[b]Calculated by multiplying the difference in average Medicaid costs between very low-birthweight and moderately low-birthweight newborns (see Table 3) by the estimated number of very low-birthweight newborns prevented. Medicaid costs refer to newborn and maternal Medicaid costs from birth to 60 days after birth. Medicaid costs are prorated for claims that extended beyond the first 60 days after birth.

[c]Hospital costs only.

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# APPENDIX

## ESTIMATED PROBIT COEFFICIENTS FOR MODELS OF VERY LOW BIRTHWEIGHT AMONG MEDICAID NEWBORNS

TABLE A.1

ESTIMATED PROBIT COEFFICIENTS FOR A MODEL OF THE EFFECT OF PRENATAL WIC PARTICIPATION ON THE INCIDENCE OF VERY LOW BIRTHWEIGHT

(Standard Errors in Parentheses)

| Explanatory Variables | Florida | Minnesota | North Carolina | South Carolina | Texas |
|---|---|---|---|---|---|
| Intercept | -2.087 ** (.103) | -2.214 ** (.171) | -1.900 ** (.102) | -1.683 ** (.148) | -1.829 ** (.077) |
| **Prenatal WIC Participation** | -.299 ** (.036) | -.221 ** (.067) | -.462 ** (.039) | -.515 ** (.054) | -.386 ** (.043) |
| **Newborn Characteristics** | | | | | |
| Male | -.045 (.035) | .079 (.065) | -.048 (.038) | .029 (.052) | -.013 (.038) |
| Multiple Birth | 1.107 ** (.062) | .873 ** (.113) | 1.160 ** (.068) | 1.029 ** (.098) | 1.142 ** (.067) |
| **Mother Characteristics** | | | | | |
| Age 18-19 | -.034 (.068) | .017 (.130) | -.051 (.071) | -.093 (.093) | -.135 (.071) |
| Age 20-34 | -.056 (.064) | -.048 (.126) | -.008 (.068) | -.176 * (.084) | -.077 (.063) |
| Age 35 and over | .038 (.120) | -.244 (.258) | .117 (.139) | .054 (.166) | .149 (.114) |
| Black[a] | .265 ** (.042) | .208 * (.100) | .226 ** (.047) | .092 (.069) | .0003 (.050) |
| Hispanic[a] | -.020 (.074) | -- | -- | -- | -.154 ** (.048) |
| Native American | -- | -.302 (.167) | -- | -- | -- |
| Asian | -- | -.264 (.200) | -- | -- | -- |
| Other race/ethnicity[a] | .127 (.213) | -- | -- | -- | -.336 * (.147) |
| Not married | .033 (.043) | -.030 (.075) | -.057 (.048) | .071 (.065) | -.014 (.042) |
| Kessner Index inadequate | .278 ** (.048) | .296 ** (.105) | .488 ** (.060) | .197 ** (.072) | .237 ** (.052) |
| Kessner Index intermediate | -.060 (.416) | -.069 (.084) | .467 ** (.103) | -.035 (.183) | -.125 * (.050) |
| Kessner Index unknown | .287 ** (.085) | .334 ** (.092) | .229 ** (.047) | -.093 (.064) | .236 ** (.068) |
| Previous live births (number) | .001 (.014) | -.088 ** (.034) | -.105 ** (.020) | -- | -.053 ** (.016) |
| Pregnancy terminations $\leq$ 20 weeks | -- | .243 (.143) | -- | -- | -- |

TABLE A.1 (continued)

| Explanatory Variables | Florida | Minnesota | North Carolina | South Carolina | Texas |
|---|---|---|---|---|---|
| **Mother Characteristics** (continued) Pregnancy terminations > 20 weeks | -- | .139 ** (.035) | .042 (.035) | -- | .214 ** (.059) |
| Education < 9 years | -.056 (.087) | .147 (.221) | .033 (.097) | .083 (.129) | -- |
| Education 9-11 years | -.081 (.062) | .166 (.117) | -.032 (.067) | -.017 (.096) | -- |
| Education 12 years | -.033 (.058) | .065 (.107) | -.031 (.061) | -.014 (.090) | -- |
| Education missing | -- | .260 (.137) | .379 (.374) | .703 ** (.230) | -- |
| Urban | .030 (.056) | -.086 (.073) | .042 (.038) | -.077 (.053) | -- |
| Prenatal care from public health clinic | -.159 ** (.061) | | -- | -- | -- |
| Sample Size | 31,734 | 11,547 | 20,703 | 11,773 | 25,710 |

SOURCE: WIC/Medicaid newborn database.

NOTE: The dependent variable is equal to one if newborn birthweight is less than 1,500 grams (3.3 pounds), and equal to zero otherwise. The unit of observation is the newborn.

*(**): Significant at the .05 (.01) level, two-tailed test.

[a]Racial/ethnicity groups varied across states. In North Carolina and South Carolina, a small number of women classified neither as white nor black are included with black women. In Texas, "black" means "black, nonspanish," "Hispanic" means "Mexican," and "Other race/ethnicity" means "other Hispanic." In Florida, "other race/ethnicity" means "Native American or Asian."

TABLE A.2

ESTIMATED PROBIT COEFFICIENTS FOR A MODEL OF THE EFFECT OF WIC PARTICIPATION BY 32 WEEKS GESTATION ON THE INCIDENCE OF LOW BIRTHWEIGHT

(Standard Errors in Parentheses)

| Explanatory Variables | Florida | Minnesota | North Carolina | South Carolina | Texas |
|---|---|---|---|---|---|
| Intercept | -2.163 ** (.102) | -2.336 ** (.171) | -1.996 ** (.101) | -1.771 ** (.147) | -1.893 ** (.076) |
| **Prenatal WIC Participation by 32 Weeks Gestation** | -.171 ** (.037) | -.032 (.068) | -.326 ** (.040) | -.397 ** (.054) | -.251 ** (.044) |
| **Newborn Characteristics** | | | | | |
| Male | -.045 (.034) | .085 (.065) | -.045 (.037) | .031 (.052) | -.011 (.038) |
| Multiple Birth | 1.109 ** (.062) | .926 ** (.113) | 1.164 ** (.068) | 1.038 ** (.097) | 1.135 ** (.067) |
| **Mother Characteristics** | | | | | |
| Age 18-19 | -.032 (.068) | .015 (.129) | -.048 (.070) | -.094 (.092) | -.126 (.071) |
| Age 20-34 | -.057 (.064) | -.047 (.126) | -.004 (.068) | -.174 * (.084) | -.068 (.062) |
| Age 35 and over | .028 (.120) | -.249 (.258) | .137 (.138) | .065 (.165) | .157 (.114) |
| Black[a] | .258 ** (.042) | .193 (.100) | .207 ** (.047) | .088 (.069) | -.016 (.050) |
| Hispanic[a] | -.019 (.074) | -- | -- | -- | -.184 ** (.047) |
| Native American | -- | -.322 (.168) | -- | -- | -- |
| Asian | -- | -.304 (.198) | -- | -- | -- |
| Other race/ethnicity[a] | .110 (.213) | -- | -- | -- | -.364 * (.146) |
| Not married | .032 (.042) | -.039 (.075) | -.050 (.048) | .070 (.065) | -.010 (.042) |
| Kessner Index inadequate | .305 ** (.048) | .340 ** (.106) | .515 ** (.060) | .194 ** (.072) | .257 ** (.052) |
| Kessner Index intermediate | -.064 (.041) | -.059 (.084) | .222 ** (.043) | -.108 (.182) | -.122 * (.049) |
| Kessner Index unknown | .308 ** (.084) | .345 ** (.093) | .303 ** (.104) | -.102 (.063) | .244 ** (.068) |
| Previous live births (number) | .004 (.014) | -.090 ** (.034) | -.102 ** (.020) | -- | -.052 ** (.016) |
| Pregnancy terminations $\leq$ 20 weeks | -- | .249 (.142) | -- | -- | -- |

TABLE A.2 (continued)

| Explanatory Variables | Florida | Minnesota | North Carolina | South Carolina | Texas |
|---|---|---|---|---|---|
| **Mother Characteristics** (continued) Pregnancy terminations > 20 weeks | -- | .139 ** (.035) | .146 ** (.028) | -- | .205 ** (.058) |
| Education < 9 years | -.063 (.087) | .147 (.218) | .020 (.100) | .067 (.127) | -- |
| Education 9-11 years | -.086 (.062) | .153 (.117) | -.042 (.066) | -.022 (.095) | -- |
| Education 12 years | -.037 (.014) | .060 (.106) | -.040 (.060) | -.021 (.090) | -- |
| Education missing | -- | .260 (.137) | .387 (.368) | .742 ** (.229) | -- |
| Urban | -.037 (.056) | -.079 (.073) | .057 (.038) | -.062 (.053) | -- |
| Prenatal care from public health clinic | -.194 ** (.060) | -- | -- | -- | -- |
| Sample Size | 31,732 | 11,547 | 20,703 | 11,773 | 25,710 |

SOURCE: WIC/Medicaid newborn database.

NOTE: The dependent variable is equal to one if newborn birthweight is less than 2,500 grams (5.5 pounds), and equal to zero otherwise. The unit of observation is the newborn.

*(**): Significant at the .05 (.01) level, two-tailed test.

[a]Racial/ethnicity groups varied across states. In North Carolina and South Carolina, a small number of women classified neither as white nor black are included with black women. In Texas, "black" means "black, nonspanish," "Hispanic" means "Mexican," and "Other race/ethnicity" means "other Hispanic." In Florida, "other race/ethnicity" means "Native American or Asian."

TABLE A.3

ESTIMATED PROBIT COEFFICIENTS FOR A MODEL OF THE EFFECT OF WIC PARTICIPATION BY 30 WEEKS GESTATION ON THE INCIDENCE OF LOW BIRTHWEIGHT

(Standard Errors in Parentheses)

| Explanatory Variables | Florida | Minnesota | North Carolina | South Carolina | Texas |
|---|---|---|---|---|---|
| Intercept | -2.186 ** (.102) | -2.356 ** (.171) | -2.023 ** (.101) | -1.797 ** (.146) | -1.905 ** (.076) |
| **Prenatal WIC Participation by 30 Weeks Gestation.** | **-.130 ** (.037)** | **.0005 (.068)** | **-.287 ** (.040)** | **-.363 ** (.054)** | **-.228 ** (.044)** |
| **Newborn Characteristics** | | | | | |
| Male | -.044 (.034) | .086 (.065) | -.046 (.037) | .031 (.052) | -.011 (.038) |
| Multiple Birth | 1.105 ** (.062) | .933 ** (.113) | 1.164 ** (.067) | 1.046 ** (.097) | 1.133 ** (.067) |
| **Mother Characteristics** | | | | | |
| Age 18-19 | -.031 (.068) | .016 (.129) | -.046 (.070) | -.094 (.092) | -.123 (.070) |
| Age 20-34 | -.057 (.063) | -.047 (.126) | -.001 (.067) | -.171 * (.083) | -.066 (.062) |
| Age 35 and over | .024 (.119) | -.250 (.259) | .148 (.138) | .061 (.165) | .159 (.113) |
| Black[a] | .256 ** (.042) | .189 (.100) | .203 ** (.046) | .087 (.069) | -.019 (.050) |
| Hispanic[a] | -.018 (.074) | -- | -- | -- | -.189 ** (.047) |
| Native American | -- | -.327 (.168) | -- | -- | -- |
| Asian | -- | -.313 (.198) | -- | -- | -- |
| Other race/ethnicity[a] | .103 (.214) | -- | -- | -- | -.370 * (.146) |
| Not married | .032 (.042) | -.041 (.075) | -.051 (.048) | .071 (.065) | -.008 (.042) |
| Kessner Index inadequate | .316 ** (.049) | .350 ** (.106) | .529 ** (.060) | .194 ** (.072) | .260 ** (.051) |
| Kessner Index intermediate | -.064 (.041) | -.056 (.084) | .219 ** (.043) | -.096 (.181) | -.123 * (.049) |
| Kessner Index unknown | .314 ** (.084) | .353 ** (.093) | .330 ** (.104) | -.106 (.063) | -.245 ** (.068) |
| Previous live births (number) | .005 (.014) | -.090 ** (.034) | -.101 ** (.019) | -- | -.052 ** (.016) |
| Pregnancy terminations $\leq$ 20 weeks | -- | .250 (.142) | -- | -- | -- |
| Pregnancy terminations > 20 weeks | -- | .139 ** (.035) | .146 ** (.028) | -- | .204 ** (.058) |

TABLE A.3 (continued)

| Explanatory Variables | Florida | Minnesota | North Carolina | South Carolina | Texas |
|---|---|---|---|---|---|
| **Mother Characteristics** (continued) | | | | | |
| Education < 9 years | -.068 | .147 | .015 | .066 | -- |
| | (.087) | (.218) | (.096) | (.127) | |
| Education 9-11 years | -.089 | .151 | -.044 | -.024 | -- |
| | (.062) | (.117) | (.066) | (.094) | |
| Education 12 years | -.038 | .059 | -.042 | -.024 | -- |
| | (.058) | (.106) | (.060) | (.089) | |
| Education missing | -- | .264 | .389 | .752 ** | -- |
| | | (.137) | (.366) | (.228) | |
| Urban | .039 | -.079 | .060 | -.057 | -- |
| | (.056) | (.073) | (.038) | (.053) | |
| Prenatal care from public health clinic | -.202 ** | -- | -- | -- | -- |
| | (.060) | | | | |
| Sample Size | 31,732 | 11,547 | 20,703 | 11,773 | 25,710 |

SOURCE: WIC/Medicaid newborn database.

NOTE: The dependent variable is equal to one if newborn birthweight is less than 2,500 grams (5.5 pounds), and equal to zero otherwise. The unit of observation is the newborn.

*(**): Significant at the .05 (.01) level, two-tailed test.

[a]Racial/ethnicity groups varied across states. In North Carolina and South Carolina, a small number of women classified neither as white nor black are included with black women. In Texas, "black" means "black, nonspanish," "Hispanic" means "Mexican," and "Other race/ethnicity" means "other Hispanic." In Florida, "other race/ethnicity" means "Native American or Asian."